

GIGANTONOCLEA IN THE LOWER PERMIAN OF TEXAS

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Following publication of the description of the gigantopterid genus Delnortea from Leonardian (Lower Permian) strata in western Texas (Mamay, Miller, Rohr, and Stein, 1986), it was shown (Mamay, 1986) that two Asiatic gigantopterid genera, Cathaysiopteris Koidzumi and Zeilleropteris Koidzumi, also occur in the Texas Permian, along with a second American gigantopterid, Gigantopteridium Koidzumi. Subsequent reexamination of unpublished material that I had collected in 1967 indicates the presence of yet another Asiatic gigantopterid taxon in Texas. K. Asama examined the specimens in 1970 and tentatively identified them as Bicoemploteris hallei Asama. Asama's valuable opinion has bolstered my convictions in regard to the similarities between the Permian floras of Asia and North America.

The material was collected at the "Emily Irish" site southeast of Seymour in Baylor County, Texas. The fossiliferous beds lie in the Belle Plains Formation, of Leonardian (Lower Permian) age; details of the occurrence were published earlier (Mamay, 1968). The locality is known as a rich source of Gigantopteridium americanum (White) Koidzumi and the only known American occurrence of Russellites taeniata (Darrah) Mamay. Russellites is otherwise known only in China.

The gigantopterid material consists of 4 small leaf fragments (USNM 422403-422406), 2 of which are illustrated here (Fig. 1). The largest (Fig 1B) is slightly less than 1 cm in its greatest dimension and contains a stout dominant vein at the left, from which two distinct lateral veins and the base of a third depart to the right; remnants of 2 equivalent veins appear on the left. From each side of the lateral veins arise thin ultimate veins at regular intervals; a few also arise directly from the main vein. As they proceed away from the main vein, the laterals lose identity through diffusion of their distal portions into ultimate veins. The ultimate veins form a closed system of small polygonal meshes with no blind-ending veinlets. The meshes are mostly elongate, with a greatest length of about 2.0 mm; most are much smaller, however. The smallest meshes are trigonal; the largest are penta- or rarely hexagonal. The largest meshes generally are those that lie directly against the main vein or the laterals, with all others gradually diminishing in size so that the smallest meshes are about midway between the laterals, where meshes from adjacent laterals merge with their opposing counterparts.

Although it shows nothing of its margin, this specimen is clearly part of a leaf with at least 3 orders of veins, with the laterals

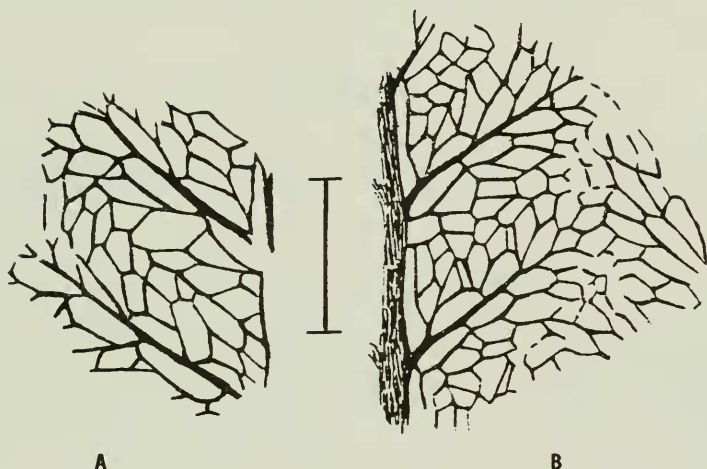


Fig. 1. Tracings of photographs of leaf fragments of *Gigantonoclea* sp., showing 3 vein orders and ultimate reticulations. A: USNM 422403; B: USNM 422404. Scale equals 3 mm.

of secondary rank and the ultimate veins tertiary. However, the arrangement of meshes suggests a more complex system of venation, i.e., one with 4 orders. Those meshes at the right of Fig. 1B and beyond the diffused ends of the lateral veins are predominantly aligned perpendicularly to the alignment of the meshes adjacent to the laterals. This is clear indication that the meshes at the right of Fig. 1B are the ultimate derivatives of an adjacent, equivalent set of penultimate and lower-order veins. Thus the "main vein" of Fig. 1B is of at least secondary rank; accordingly the ultimate veins are at least quaternary.

The specimen seen in Fig. 1A also lacks evidence of the leaf margin, showing only parts of 2 penultimate veins within the surrounding meshwork of ultimate veins. However, the precise angularity of its meshes and their orientation relative to the penultimate veins duplicate those features of Fig. 1B. The chief difference between the two specimens is one of relative sizes: the intercostal distance in Fig. 1A (3.0 mm) is greater than that of Fig. 1B (2.5 mm), and the largest meshes in Fig. 1A are proportionately longer. These minor quantitative differences are possibly of specific significance, but a taxonomic differentiation requires more extensive material.

The unimpressive appearance of these small fragments belies their paleobotanical importance, for the presence of a reticulate pattern of ultimate veins arising from parallel penultimate veins is

in itself sufficient to distinguish a taxon of Gigantopteridaceae. That combination of foliar characteristics appears in no other group of Paleozoic plants.

Because of their distally diffuse penultimate veins, their polygonal meshes, and the lack of sutural veins, these specimens are readily distinguished from the 4 other gigantopterid genera now known in North America: Cathaysiopteris, Gigantopteridium, Delnortea, and Zeilleropteris (Mamay et al., 1988). The same set of characters denotes close relationship with specimens designated by Gu et Zhi (1974, Fig. 103, 2-3) as Gigantonoclea lagrelii (Halle) Koidzumi and G. hallei (Asama) Gu et Zhi; both taxa are from the Permian of China (the latter is Bicoempletopteris hallei of Asama, 1959). Although comparisons of gross architecture cannot be made between the Chinese and American material, the known resemblances between the two sets (Gu et Zhi, Fig. 103, 2, and present Fig. 1A; Gu et Zhi, Fig. 103, 3, and present Fig. 1B) are so exact that congenericity is reasonably assumed. I therefore refer the Texas specimens to the genus Gigantonoclea, sensu Gu et Zhi, 1974, but defer specific designation until clarification of such questions as number of vein orders and laminar division becomes possible through additional material.

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